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# Who Uses the Cost-Benefit Rules of Choice? Implications for the Normative Status of Economic Theory

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for

Contracting Officer's Representative  
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# WHO USES THE COST-BENEFIT RULES OF CHOICE? IMPLICATIONS FOR THE NORMATIVE STATUS OF ECONOMIC THEORY

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## Who Uses the Cost-Benefit Rules of Choice?

### Implications for the Normative Status of Economic Theory

A basic distinction is made in the field of decision making between normative and descriptive models of choice behavior. A normative model is one that depicts how people ought to make decisions in order to maximize their personal outcomes and a descriptive model is one that depicts how people actually make decisions. Although the microeconomic model of choice has been advanced as both a normative and a descriptive model, it has fared better in the former role than in the latter. A large accumulation of empirical evidence indicates that certain aspects of the microeconomic model do not describe people's ordinary decision processes (Daniel Kahneman and Amos Tversky, 1979; Tversky and Kahneman, 1986). The fact that the model often fails as a descriptive model raises the question, If people do not commonly use economic reasoning, why should we believe that it is normative? Why is it the way we ought to think about the world?

Different methods are typically used to evaluate the normative versus the descriptive strength of a model. Normative adequacy has usually been tested by formal, mathematical proof, whereas descriptive adequacy has been tested by empirical means. To defend the normative adequacy of choice models, economists have argued that the model is based on a few assumptions, such as transitivity of preference, that most people agree are intuitively reasonable criteria for good decision making. If one assents to the assumptions, economists argue, then one assents to the model because it is mathematically implied by the assumptions.

But there is also a tradition of justifying, and amending, normative models in response to empirical considerations. James March (1978), for example, argues that the fact that clients are willing to purchase the services of experts with skills in the decision sciences speaks positively to the normativeness of the model employed by the experts. And Herbert Simon (1955) argued that "satisficing" due to time and energy constraints more nearly describes people's choice behavior than the optimizing posited by the normative model. Simon and others have reasoned that this suggests that the normative model is not the correct "prescriptive" one, that is, that the choice model that people ought to use is one that takes into account their cognitive limitations.

Some people might be inclined to think that empirical arguments are not appropriately raised in connection with considerations of normativeness, viewing this as an instance of the naturalistic fallacy, or moving from an "is" to an "ought." But in fact there is a long-standing tradition in epistemology of treating pragmatic considerations as prior to purely reflective ones. Hume held that "reason is and ought to be the slave of passion," by which he meant that human needs and their most efficient means of solution dictate the mental procedures that underlie inference and choice. The modern inheritors of the Hume tradition in epistemology describe their position as consequentialism, by which they mean that the appropriate gauge of a putatively normative cognitive procedure is whether it produces consequences that are beneficial for the individual (Alvin Goldman, 1978, 1986; Stephen Stich, 1990; see also Stich and Richard Nisbett, 1980; Paul Thagard, 1982; Thagard and Nisbett, 1983).

A second respect in which empirical considerations affect normative assumptions concerns whether people's behavior is corrigible by a putatively normative model. Goldman (1978, 1986) has argued that a rule system cannot be held to be normative if people cannot actually use it, or be taught to use it. Applying these considerations to microeconomic choice theory, we can generate three easily-tested predictions that would reflect on the normativeness of the theory.

First, it ought to be the case that the consequences of using putatively normative principles ought to be superior. Economists claim that using the principles will maximize (or at least improve) outcomes and lead to greater life success. The argument is that use of the principles makes people more efficient in their use of scarce resources such as time and effort. As a result, one would expect that people who use cost-benefit rules would be more productive and thereby receive greater returns in school or work. We measured outcomes in two different ways -- by grade point averages in the case of undergraduates, and by salaries and raises in the case of professional academics. Of course, other explanations for a positive relationship would be plausible. Perhaps productive people seek optimal rules to help them manage their time and energy; or a third factor, such as motivation, leads to both greater productivity and the use of economic reasoning. Whatever the explanation, the finding is relevant to questions of

normativeness. If it were to turn out not to be the case that people who use the principles have better outcomes, this would throw doubt on the claims of the model to normativeness.

A second expectation from present considerations is that intelligent people would be more likely to use economic reasoning. Because intelligence is generally regarded as being the set of psychological properties that make for effectiveness across environments (Jonathan Baron, 1985, p. 15; Robert Sternberg, 1985, 1988), intelligent people should be more likely to use the most effective reasoning strategies than should less intelligent people. Evidence for a link between intelligence and use of normative inferential rules has been obtained by Christopher Jepson, David Krantz, and Nisbett (1983) in the statistical reasoning domain. They found that, in a sample of untrained undergraduates, use of presumably normative statistical rules to solve problems drawn from everyday life was positively correlated with verbal and mathematical skills as measured by standardized test scores. In this paper, we examine the relationship between the use of economic reasoning and intelligence as measured by undergraduates' scores on the Scholastic Aptitude Test.

A third implication is that people ought to be trainable by the principles of microeconomic choice in the sense of coming to use them in everyday life choices once they have been exposed to them. If use of the rules leads to more desirable outcomes, people should be increasingly likely to use them due both to people's seeing the superiority of the rules in principle and to their experience of improved outcomes. We have shown in a previous paper (Richard Larrick, James Morgan, and Nisbett, 1990) that professional training in economics is positively correlated with cost-benefit reasoning, and that naive subjects who have been given brief training in one of the rules of cost-benefit (the sunk cost rule) subsequently use the rule outside the laboratory. In this paper we attempt to extend the finding by examining the relationship between taking university economics courses and the use of cost-benefit reasoning.

The specific economic model we examine is the cost-benefit model of microeconomics (Edward Mishan, 1976; Morgan and Gregory Duncan, 1982), which we envision as a set of rules that guide reasoning about choices. We depict the model as a set of rules because the rule-based approach to reasoning has been influential in cognitive psychology and has received substantial

empirical support in a range of reasoning domains (Alan Newell and Herbert Simon, 1972; John Holland, Keith Holyoak, Nisbett, and Thagard, 1986). The cost-benefit model holds that when a person is confronted with a set of possible actions each of which can lead to some set of outcomes, the person should convert the benefits and costs of all possible outcomes to a single scale, and adjust them for the probabilities that the outcomes will occur. In this calculation, the following three principles apply.

- 1) The net-benefit principle. The action that has the greatest expected net-benefit should be chosen from a set of possible actions.
- 2) The sunk cost principle. Only future benefits and costs should be considered in current decisions. Past costs and benefits are not relevant, unless they predict future benefits and costs.
- 3) The opportunity cost principle. The cost of engaging in a given course of action is the loss of the benefits of the next-best course of action.

We will attempt to distinguish use of rules such as these from mere preference or value differences. The question of whether different kinds of people are using different rules or simply hold different values arises in several contexts. One has to do with alleged differences between men and women in their use of economic rules of choice. There is a well-established finding in the literature on the teaching of economics that men perform better than women in economics classes and on tests of economic knowledge (Julia Heath, 1989; Michael Watts and Gerald Lynch, 1989). The most common explanations refer to the well-documented differences in socialization between boys and girls with respect to mathematics ability. Boys are more likely to be encouraged to be interested in math in general and financial matters in particular, whereas girls may be actively discouraged from such interests, or at least made to doubt their abilities. We propose that the difference between men and women in use of economic rules may not be due exclusively to math fear. It may be due at least in part to differences in moral reasoning between the sexes. This topic has received attention in the literature on moral development, following Carol Gilligan's (1982) work, which holds that women tend to value compassion for others more than do men, whereas men tend to value justice more than do women. In the studies described below we examined

subjects' use of microeconomic principles both when they conflicted with humanitarian values and when they did not. If women differ from men in their values rather than in their understanding of microeconomic rules of choice, their answers should differ from those of men primarily when the principles of choice conflict with a humanitarian value.

We also examined a second issue concerning values. It is sometimes contended that formal exposure to economics makes people more selfish or more concerned with money (Robert Frank, 1988) or, alternatively, that more selfish people choose to make themselves familiar with economics. To examine this possibility, we measured the extent to which subjects were concerned with money, pleasure and other benefits.

We present two studies in which we examined correlates of cost-benefit reasoning. In the first study, we administered an economic reasoning survey to a random sample of University of Michigan seniors, and obtained information on economics training (number of economics classes), academic effectiveness (grade point average), intellectual skills (standardized aptitude test scores), and gender. In the second study, we surveyed 125 University of Michigan faculty from three disciplines (economics, biology, and humanities), and obtained information on career effectiveness (salary and raise), gender, and age. Some of the discipline results from the second study have been reported previously in a paper on the effect of training (Larrick et al., 1990).

### **I. Study 1: Survey of Undergraduates**

In Study 1, we examined whether academic effectiveness, intellectual aptitude, economics training, and gender of college students are related to cost-benefit reasoning. We surveyed seniors because they have had a greater opportunity to have their reasoning about everyday choices affect their academic performance.

We constructed five types of questions--questions about people's own behavior and choices, questions about social policy that did not involve a conflict of cost-benefit rules and other values, questions about social policy that did involve such a conflict, questions reflecting a recognition of what rules economists hold to be normative, and questions about the salience of money and pleasure. If cost-benefit rules are normative, we would expect academic effectiveness,

intellectual ability, and economic training to predict use of the rules in subjects' personal choices and policy choices, at least for problems for which there is no value conflict. If economic training is effective, we would expect that it would be positively related to the recognition of normative economic reasoning. Because we argue that it is reasoning about benefits and costs and not the sheer pursuit of money or pleasure that underlies the use of economic reasoning, we expected that the independent variables would not be related to salience of money and enjoyment.

One hundred students who were listed as seniors at the beginning of the 1989-1990 academic year were randomly selected from the student directory (56 men, 44 women). Near the end of the 1989-1990 academic year, they were contacted by mail and offered five dollars for filling out and returning a short questionnaire on decision-making. Three follow-up contacts were made to encourage people who had not returned it to complete the survey. Eighty-six subjects completed and returned the questionnaire (48 men, 38 women).

A. Survey Questions. Five indices were created by averaging the scores for each of several types of question. All questions were scored on a 0 to 1 scale, with 0 indicating reasoning counter to cost-benefit principles and 1 indicating reasoning in line with the principles. A lack of preference was assigned an intermediate score of .5.

1. Own behavior and decisions (8 questions, 9 items)<sup>1</sup>

The first set of questions was about reasoning subjects used in their own decisions and behaviors. These questions measured the extent to which subjects ignored sunk costs and attended to opportunity costs in their day-to-day decisions. An example of a question about decisions they had actually made was "In the past 3 years, have you ever started one of the following but not finished it?" The question was followed by a list of activities, such as a restaurant meal, a movie at a theater or attendance at an athletic event. An average was taken across all of the items as a measure of willingness to ignore sunk costs. Subjects were also asked whether they had ever started a paper over after nearly finishing it. A "yes" answer indicates a willingness to ignore sunk costs. Subjects were also asked a series of open-ended questions. For instance, they were asked "Of the careers that you have decided not to pursue, what was the one you liked best? Why did

you decide not to pursue it?" Answers were coded for reference to the probability of outcomes, for example, referring to "the difficulty of the field" or referring to themselves as "not talented enough," or "too unlikely to find a job."

Subjects were also asked open-ended questions about some common decisions they might make in their everyday lives. One question read, "You and a friend have each spent \$5 to see a movie that is turning out to be pretty bad. What are good reasons for staying to see the end? What are good reasons for leaving?" Stating that the spent money was a good reason for staying was scored as a failure to ignore sunk costs. Stating that the movie was a waste of time was a good reason for leaving was scored as partial attendance to opportunity costs, and stating that there might be better things to do was scored as full attendance to opportunity costs.

## 2. Policy choices (4 questions, 7 items)

The second set of questions was about university and government policy issues for which economic reasoning led to the same conclusion as would the consideration of a humanitarian value. An example of an opportunity cost problem is:

Some financial planners for the university anticipate that jobs for young people may soon be much more plentiful than in the recent past, for the simple reason that a much smaller fraction of the population is in the younger age group. One implication is that pay will increase for entry level jobs in all kinds of industries. The argument has been made that the university should respond to this situation by offering more money for scholarships in order to lure low income students away from starting work and toward continuing their education. Do you feel:

(1.00) \_\_\_\_\_ scholarships should be kept competitive with salaries

(0.00) \_\_\_\_\_ scholarships should simply maintain pace with inflation and not respond to competitive inducements

(0.50) \_\_\_\_\_ or you do not have an opinion? (from Larrick et al., 1990)

The cost-benefit analysis of the problem indicates that, as the opportunity costs of going to college increase for students, universities will have to increase their financial aid in order to

maintain their attractiveness to students. In this case, the cost-benefit recommendation is consistent with the salient humanitarian consideration that low income students should receive financial assistance with their education.

### 3. Policy-choices value conflict (9 items)

The third set of questions was similar to the second, except that these questions asked about university and government policy for which cost-benefit reasoning supports an option that conflicts with a salient humanitarian consideration. The following is an example of a net-benefit problem in which the cost-benefit answer conflicts with values against exploitation of another's weakness.

As you may know, there are continuing problems with assuring that blood supplies for patients are free of all viruses. The suggestion has recently been made to purchase blood from Asians for use in the West, on the grounds that many of the most dangerous viruses, including AIDS, are less common there. Many citizens of relatively poor Asian countries would be happy to have the extra cash; however, others have argued that such a practice would be an inappropriate form of exploitation. Do you tend to:

(1.00) \_\_\_\_ favor the idea strongly

(0.75) \_\_\_\_ favor it somewhat

(0.50) \_\_\_\_ have no preference

(0.25) \_\_\_\_ oppose the idea somewhat

(0.00) \_\_\_\_ oppose it strongly (from Larrick et al., 1990)

The following is an example of an opportunity cost problem in which the cost-benefit answer conflicts with the knowledge of certain harm to individuals resulting from the choice.

The state of Michigan is anticipating a large budget deficit, and is trying to find budget items on which it can reduce spending. One program that has recently been mentioned is funding for road and bridge repair. Experts estimate that a \$200 million cut in the highway fund would lead to only five to ten more people dying each year in automobile accidents than do at the present. Many legislators have argued that it is

morally wrong to let people die due to the state's negligence. Others have argued that this large saving would keep more beneficial programs funded. Do you tend to favor:

(0.00) \_\_\_ spending the money to repair the state's highways and bridges.

(1.00) \_\_\_ spending the money on other programs

(0.50) \_\_\_ no preference

#### 4. Recognition of economic reasoning (6 items)

The fourth set of questions measured whether subjects could correctly identify economic reasoning. An example of a sunk cost recognition problem is the following. The multiple choice responses represented different combinations of behavior (continuing vs. discontinuing an activity that involved a sunk cost) and reasoning (attending to sunk costs vs. ignoring sunk costs):

Imagine that you have paid \$5 for a movie that is turning out to be pretty bad. If the movie had been free, you probably wouldn't stay. What do you think an economist would recommend doing?

(0.00) \_\_\_ Stay, even though it's bad, because you've spend the \$5 on it. Otherwise, you're wasting your money. (Sunk cost trap behavior, sunk cost trap reasoning.)

(0.50) \_\_\_ Leave, because the boredom of a bad movie is worse than the \$5 you lose by leaving. It's more costly to stay than to leave. (Economic behavior, sunk cost trap reasoning.)

(1.00) \_\_\_ Leave, because the movie is bad and \$5 doesn't matter anymore. If you wouldn't stay for free, you shouldn't stay because it cost \$5. (Economic behavior, economic reasoning.)

(0.50) \_\_\_ Stay, because the movie might get better. You should think of the \$5 as a gamble that might pay off. (Sunk cost trap behavior, non-economic reasoning.)

The economic combination was given the highest score, the trap combination the lowest score, and the mixed combinations were given the same intermediate score.

5. Salience of money or enjoyment (4 questions, 6 items)

The fifth set of questions was about the importance of money or enjoyment in the person's own decisions and behaviors. This index was used to measure the pursuit of self-interest. For example, the question "Of the careers that you have decided not to pursue, what is the career that you liked the best? Why did you decide not to pursue it?" was coded for a) mention of pay or financial stability and b) mention of anticipated enjoyment.

Questions about gender and number of economics classes taken were included at the end of the questionnaire. In addition, subjects were asked for permission to contact the University for college grade point average (GPA) and standardized test scores, which were either Scholastic Aptitude Test (SAT) or American College Test (ACT) verbal and mathematics aptitude scores.

**B. Results and Discussion.** The five dependent variables were analyzed using ordinary least squares regression. The regressions included as independent variables were GPA, SAT Verbal score, SAT Math score, number of economics classes and gender as a dummy variable with males coded as 1 and females coded as 0. American College Test (ACT) scores were converted to SAT score form for subjects who had not taken the SAT.<sup>2</sup> SAT Verbal and SAT Math scores had zero-order correlations with the dependent variables that were similar except that in every case the Verbal scores were more highly positively correlated with the dependent variables than the Math scores, in most cases substantially so. The same relation held for the regression coefficients. The standardized regression coefficients for all independent variables except SAT Math score are reported in Table 1.

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Insert Table 1 about here  
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The measure of academic effectiveness, grade point average, was positively related to choosing the economic response for own behaviors and decisions and for policy choices for which there was a conflict with humanitarian values. Intelligence, as measured by SAT Verbal Score, was positively related to choosing the economic response for policy choices both when there was

Table 1

**Standardized Regression Coefficients for Measures of Economic Reasoning Regressed on Grade Point Average, Verbal Score, Number of Economics Classes, and Gender.**

	Own Behavior and Decisions	Policy Choices	Policy Choices-- Value Conflict	Recognition of Economists' Position	Salience of Money and Enjoyment
Grade Point Average	.42***	.01	.22*	.14	.05
Verbal Score	.11	.36*	.52***	.45***	-.09
Economics Classes	.23*	.04	.33*	.24*	-.02
Gender	.18	.20	.46***	.14	-.14

**Note.** Analyses also control for Math score. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

and when there was not a conflict with humanitarian values. The SAT Verbal measure was also positively related to recognition of economists' position on various economic problems. The more economics classes the student had taken, the more likely the student was to prefer the economic response for own behavior and decisions and for policy choices when there was a value conflict, and to recognize what the economist's position is on a variety of problems.

Gender was related to choice of economic responses only for problems where there was a conflict with humanitarian values. None of the variables was related to our measure of the salience of money and enjoyment. What this indicates most notably is that we find no evidence that economics training is associated with an enhanced concern with money or pleasure. Thus the preference of economically-trained students for cost-benefit answers to problems is probably related to their preference for the rule system and not to a greater concern with money or with maximizing pleasure.

It is important to note that the zero-order correlations between independent and dependent variables are in general quite similar to the regression coefficients in Table 1. An interesting exception is the correlation between GPA and the own behavior and decisions index, which was .32 -- lower than the regression coefficient of .42, and the correlation between Verbal score and the own behavior and decisions index, which was .25 and significant at the .04 level -- higher than the nonsignificant .11 regression coefficient. What this discrepancy suggests is the conclusion that students who obtain higher GPAs than would be predicted by their intelligence are particularly likely to use normative choice rules in their own behaviors and decisions. (GPA was positively correlated only with the intelligence measures, not with the other independent measures.) Conversely, students whose intelligence is higher than that of most people at their level of GPA are not likely to use normative rules in their own behaviors and decisions. The other theoretically interpretable difference is that the zero-order correlation between economics training and the own behavior variable was a nonsignificant .17. But the significant regression coefficient of .23 is the more meaningful indicator of the relationship, since it is more sensible to look at the effects of training net of intelligence, GPA, and gender than it is to look at the uncorrected relationship. The

only other zero-order correlations that differ notably in magnitude from their comparable regression coefficients are the correlation between GPA and policy choices with value conflict (a nonsignificant .13), the correlation between GPA and recognition of economists' position (a significant .22), and the correlation between gender and salience of money and pleasure (a significant -.26), indicating that female students are more concerned with money and pleasure than male students (though not, for reasons we do not pretend to understand, when their levels on our other independent variables are taken into consideration).

Our major predictions are well supported by the data. Adherence to economic reasoning, for two of three choice indices, was greater for students with higher GPAs (and for students with higher GPAs than would be predicted by their intelligence), higher for more intelligent students, and higher for students with training in economics. In addition to these measures for personal choice, greater recognition of normative reasoning was shown by more intelligent students and by students having training in economics. Neither economics training, nor the other independent variables was associated with greater salience of money or pleasure in decision-making. Finally, the data supported our supposition that females' adherence to economic rules differs from that of males primarily in that it simply takes a backseat to humanitarian values. Females were significantly less likely to give answers in line with cost-benefit rules only for problems for which the rules gave an answer in conflict with such values.

## II. Study 2: Survey of Faculty

In Study 2, we reexamined data collected in a survey of economic reasoning administered to University of Michigan faculty. Professors of economics, biology, and the humanities were asked two types of questions, one type measuring behavior reflecting economic choices and the other type measuring reasoning about university and international policy.

The independent variables in Study 2 were salary, academic discipline, gender, and age. The study allows us to replicate the training and gender findings of Study 1, and to attempt a conceptual replication of the life consequences finding by examining salary instead of grade point average.

All of the professors in the economics, biology, art history, and modern languages departments at the University of Michigan were contacted by telephone and asked to participate in a twenty minute telephone survey on university policy and personal choices. Overall, 88% of the professors agreed to participate.

A. Survey Questions. Two types of reasoning questions were included on the faculty survey: reasoning about university and international policy. Several of the questions were identical to those asked of the university seniors. For example, two of the policy questions were the one concerning buying blood from poor Asians and the one concerning raising scholarships to keep low income students from seeking work.

The policy questions were followed by questions about consumer and time-use choices subjects had actually made. For instance, the faculty were asked a question similar to the one asked of the university seniors in Study 1: "In the past five years, have you ever started one of the following items and then not finished it?" This was followed by a list of seven consumer items. Discontinuing an activity for which one has already paid is an indication that one is willing to ignore sunk costs. Faculty were also asked, "Have you ever dropped a research project that was not proving worthwhile?" which measures willingness to ignore a sunk cost and to attend to opportunity costs. They were also asked about time use ("Do you do some of the maintenance on your car?") and attempts to save time ("Do you own a microwave? A dishwasher?") Freeing up time for other activities by having someone else perform menial work and by investing in time-saving appliances were considered measures of attending to opportunity costs.

The questions were subsequently reclassified into three types: no conflict with humanitarian values (for example, the scholarship question), conflict with humanitarian values (for example, the blood purchase question), and money and enjoyment maximization (for example, "do you own a microwave?"). It should be noted that the last index is not directly comparable to the salience of money and enjoyment index used in Study 1. The Study 1 index included questions asking subjects to describe the considerations that would enter into different decisions they might make, and then the responses were coded for the mention of financial or of enjoyment concerns.

The Study 2 index consisted of questions that asked subjects about how they managed their money and about whether they own creature comforts.

Subjects also provided demographic information regarding gender and age. Six years of salary data were obtained from published sources at the university.

**B. Results and Discussion.** The behavior and policy choice indices were regressed on salary, discipline, gender, and age. The standardized regression coefficients for these variables are reported in the left side of Table 2.<sup>3</sup> It should be noted that zero-order correlations yield very similar conclusions for each of the relationships in Table 2, with zero-order correlations being in general higher. We believe it is more appropriate, however, to focus on the relationships involving each of the independent variables net of the others.

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Insert Table 2 about here  
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It may be seen in Table 2 that higher salaries were significantly related to economic behavior and policy choices. The salary results were actually stronger when the economists were omitted from the sample. When the sample included only biologists and humanists, the standardized salary coefficients were .32 for behavior and .43 for policy choices.

It may be seen in the right side of Table 2 that higher salaries were significantly related to economic reasoning both when it was and when it was not in conflict with humanitarian values. These relationships also held when the salary sensitive items (for example, ownership of labor-saving devices) were removed from the indices. The relationships were once again stronger when the economists were excluded from the sample (standardized regression coefficients of .30 for salary for both conflict and no conflict items). Salary was positively related to money and pleasure maximization, but not significantly so. (Recall that the three indices on the right of Table 2 are mere recategorizations of the items composing the indices on the left.)

Another measure of effectiveness is the average size of raise, which may be regarded as reflecting changes in the rate of effectiveness. Average raise over the past five years was (weakly)

Table 2

**Standardized Regression Coefficients for Economic Reasoning Regressed on Salary, Economics Training, Gender, and Age.**

	Behavior and Policy Indices		Value Indices		
	Own Behavior and Decisions	Combined Policy Choices	No Value Conflict Items	Value Conflict Items	Money- and Enjoyment-Directed Behavior
Salary	.25*	.33***	.24*	.26**	.17
Economics	.42***	.27**	.32**	.34***	.24*
Gender	.11	.20**	.01	.19*	.15
Age	-.02	-.30**	.00	-.27**	-.05

**Note.** The reasoning and behavior indices and the value indices are different ways of indexing the same items. They are not independent findings. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

related to economic reasoning for policy choices (regression coefficient = .15,  $p = .07$ ). Again, the relationship is stronger -- though not more statistically significant because of the smaller sample size -- when the economists are excluded (coefficient = .19,  $p = .11$ ).

As has been reported previously by Larrick et al., economics training was significantly related to economic reasoning and behavior. It may be seen from the right side of Table 2 that economics training was significantly related to economic reasoning across the value indices: when it did not conflict with humanitarian values, when it did conflict with humanitarian values, and when it involved money and pleasure maximization. This latter finding suggests that critics may be right when they say that extensive training in economics enhances the importance of material goods and pleasure.

Gender was not related to behavior. Men were more likely to endorse economic reasoning for the policy index than were women, but this was due entirely to differences when there was a value conflict. It may be seen that men and women showed no difference on the no conflict items, but a significant difference on the conflict items.

Age was not related to economic behavior but was significantly related to cost-benefit reasoning such that younger subjects employed more normative reasoning. This difference was confined to problems where economic reasoning conflicted with humanitarian values. Younger subjects were more likely to employ economic reasoning only for problems for which there was such a conflict. We cannot tell whether this is a developmental effect, leading us to expect that the younger subjects will eventually come to resemble older subjects, or a cohort effect reflecting what may be a stable preference in the younger generation for cost-benefit analysis even when its conclusions conflict with other values. An answer will have to await the arrival of another generation or two of academics.

### III. General Discussion

The present results greatly expand the empirically-based case for the normativeness of cost-benefit rules. As economic theory predicts, the people who use these principles are more likely to have successful life outcomes. The college seniors who used cost-benefit reasoning in their

everyday decisions had higher grade point averages, including higher averages net of their aptitude, and the faculty who used cost-benefit reasoning in their everyday behaviors had higher salaries. These data cannot answer questions of causality and tell us whether use of the rules leads to greater success, greater success leads to use of the rules, or some third factor causes both. However, Study 1 shows at least that the relationship between cost-benefit reasoning and academic effectiveness is independent of intelligence and of economics training.

Additional evidence for the normative claim of cost-benefit reasoning comes from the fact that it was positively related to intelligence in Study 1. As Baron (1985) and others have defined it, intelligence is the set of psychological properties that enable a person to achieve his or her goals effectively. On this view, intelligent people will be more likely to use rules of choice that are effective in reaching their goals than will less intelligent people.

Finally, our results are consistent with Larrick et al.'s claim that people's choices are corrigible by the rule system. We found in Study 1 that the number of economics classes taken was positively correlated with cost-benefit reasoning and in Study 2 that economists were more likely to use the rule system than noneconomists.

The fact that effectiveness, intelligence, and training were related to economic reasoning even when it conflicted with certain humanitarian values raises interesting normative questions concerning the conflict between maximizing material well-being for society as a whole and concern with principles of fairness and compassion. These findings suggest that many of the people who know and use the rules in their own decisions believe that they are beneficial when applied to a larger social context, even when there are costs involving important values. On the other hand, the women in both studies and the older faculty in Study 2 tended to favor humanitarian considerations when they conflicted with the cost-benefit rules. Men seemed to be concerned with issues of maximizing material well-being to society in general, even when some individuals or groups incur social costs but reap material benefits. (For example, men were more likely to endorse purchasing blood from poor Asians.) Women seemed to be more concerned with imposing inequalitarian or debasing outcomes on a group or individuals.

We believe that the same type of difference in moral reasoning underlies the finding that age was related to use of economic reasoning when it conflicted with certain humanitarian concerns. There is some evidence indicating that the age difference reflects at least in part a cohort effect. A fair amount of survey data indicates that members of the present younger generation hold more conservative values related to humanitarian concerns than their elder colleagues, who were often found marching in the streets to uphold those values when they were younger (Ronald Inglehart and Scott Flanagan, 1987; American Council on Education, 1973-1986). But we also suspect, in this case in the absence of supporting data, that people become more concerned with individual welfare and more dubious of abstract utilitarian principles as they grow older. We close by noting that we are sympathetic with the perspective of our female subjects and our older subjects. We believe that a complete set of normative rules for choice must include rules that can adjudicate between cost-benefit reasoning and moral considerations reflecting such considerations as the rights of particular individuals and expressing concern with exploitation.

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#### Footnotes

<sup>1</sup>Because some of the questions were open-ended, they could be coded for the presence or absence of several different types of responses. Thus, some questions contributed more than one item to an index.

<sup>2</sup>There were no records of standardized test scores for seventeen subjects who had transferred to the university after their first year. We ran two regressions to test whether the complete sample of 86 was different from the sample of 69 for whom we had all independent variables. We excluded test scores from these regressions to determine whether the remaining independent variables had the same relationship to the dependent variables in both samples. The results were essentially the same, so we report the analyses for the sample of sixty-nine subjects for which we have values for all of the independent variables.

<sup>3</sup>Some of the items in the behavior index (e.g., discontinuing an activity for which a sunk cost was incurred) could be affected by consumption opportunities (e.g., how often the person sees movies, plays, concerts, and so on), so the analysis was repeated with consumption opportunities included as an additional independent variable. It was not significant ( $p > .20$ ) and did not change the significance levels of any of the independent variables.